

In the Claims

Please replace claims 1, 3, 4, 8, 10, 20-22, and 26 with the following clean version of the amended claims, add new claims 52-55, and cancel claims 32-51 in accordance with 37 C.F.R. § 1.121(c)(1)(i). Cancel all previous versions of any amended claim.

A marked up version showing amendments to any claims being changed is provided in one or more accompanying pages separate from this amendment in accordance with 37 C.F.R. § 1.121(c)(1)(ii). Any claim not accompanied by a marked up version has not been changed relative to the immediate prior version, except that marked up versions are not being supplied for any added claim or canceled claim.

1. (amended) A method of forming a dielectric layer comprising:
providing a substrate comprising a silicon-containing surface;
forming a layer of silicon dioxide overlying at least one portion of the surface;
forming a metal layer over the layer of silicon dioxide; combining metal of the metal layer with oxygen of the silicon dioxide layer to form a metal oxide as a first metal-containing dielectric layer over the surface, the metal comprising an element selected from Group IVB of the periodic table; and
forming a second metal-containing dielectric layer over the first metal-containing dielectric layer.

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3. (amended) The method of Claim 1, wherein the second metal-containing dielectric layer is formed on the first metal-containing dielectric layer.

4. (amended) The method of Claim 1, wherein the metal layer comprises hafnium.

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8. (amended) The method of Claim 1, where the metal layer comprises a hafnium-containing layer and the forming of the second metal-containing dielectric layer comprises:

forming a lanthanum-containing layer over the hafnium-containing layer; and
exposing the hafnium-containing layer and the lanthanum-containing layer to an oxygen comprising atmosphere and heating the hafnium-containing layer and the lanthanum-containing layer to a temperature effective to form a hafnium-containing dielectric layer and a lanthanum-containing dielectric layer.

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10. (amended) The method of Claim 8, where the exposing comprises ion bombardment of the hafnium-containing layer and the lanthanum-containing layer using an ion bombardment energy of about 10 electron volts (eV) or less.

a b B^{sub} 20. (amended) A method for forming a MOS transistor, comprising:
providing a semiconductor substrate having a surface comprising silicon;
forming a hafnium-containing dielectric layer overlying the surface, including first forming a hafnium-containing layer;
forming a lanthanum-containing dielectric layer overlying the hafnium-containing dielectric layer, including second forming a lanthanum-containing layer, the first forming and the second forming encompassing physical vapor deposition; and
forming a gate electrode over the hafnium-containing and lanthanum-containing dielectric layers.

21. (amended) The method of Claim 20, wherein the lanthanum-containing dielectric layer is formed on the hafnium-containing dielectric layer.

22. (amended) The method of Claim 20, where physical vapor deposition comprises electron beam evaporation.

a¹ 26. (amended) The method of Claim 24, where the heating comprises heating the hafnium and lanthanum containing layers to a temperature from about 200°C to about 400°C.

sub 52. (new) A method of forming a dielectric layer comprising:
providing a substrate comprising a silicon-containing surface;
forming a first metal-containing dielectric layer over the surface, the first layer comprising an element selected from Group IVB of the periodic table; and
forming a second metal-containing dielectric layer on the first metal-containing dielectric layer, the second layer comprising an element selected from Group IIIB of the periodic table.

53. (new) A method of forming a dielectric layer comprising:
providing a substrate comprising a silicon-containing surface;
forming a metal layer over the surface;
oxidizing the metal layer to form a metal oxide as a first metal-containing dielectric layer over the surface, the metal comprising an element selected from Group IVB of the periodic table; and
forming a second metal-containing dielectric layer over the first metal-containing dielectric layer.

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54. (new) A method for forming an MOS transistor, comprising:
providing a semiconductor substrate having a surface comprising silicon;
forming a hafnium-containing dielectric layer overlying the surface;
forming a lanthanum-containing dielectric layer on the hafnium-containing dielectric layer; and
forming a gate electrode over the hafnium-containing and lanthanum-containing dielectric layers.
55. (new) A method for forming an MOS transistor, comprising:
providing a semiconductor substrate having a surface comprising silicon;
forming a hafnium-containing layer overlying the surface;
oxidizing the hafnium-containing layer into a hafnium-containing dielectric layer;
forming a lanthanum-containing dielectric layer overlying the hafnium-containing dielectric layer; and
forming a gate electrode over the hafnium-containing and lanthanum-containing dielectric layers.